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AVERAGE MONTHLY LAYER DEPTH IN THE NORTH ATLANTIC.(U)
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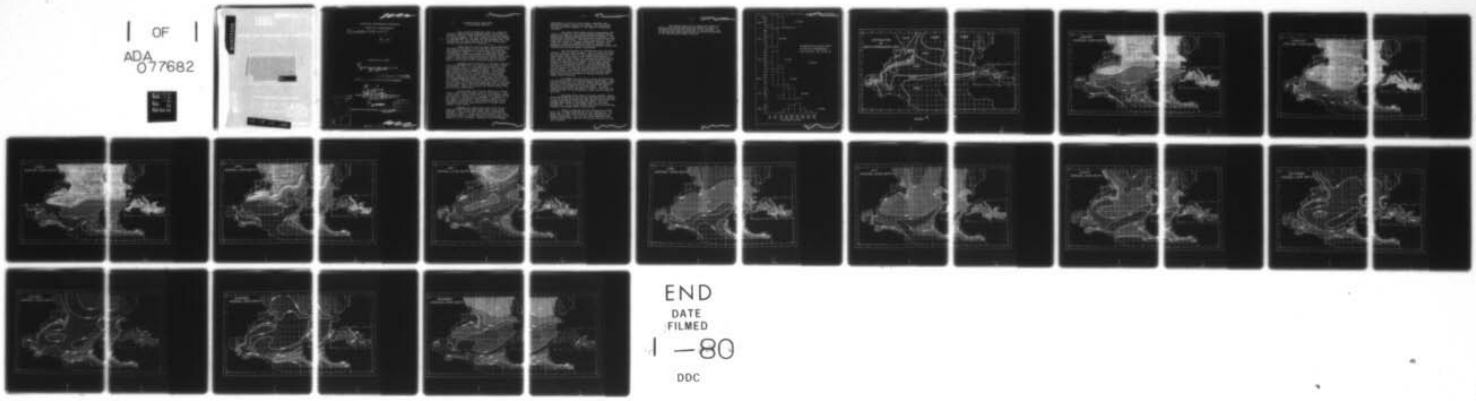

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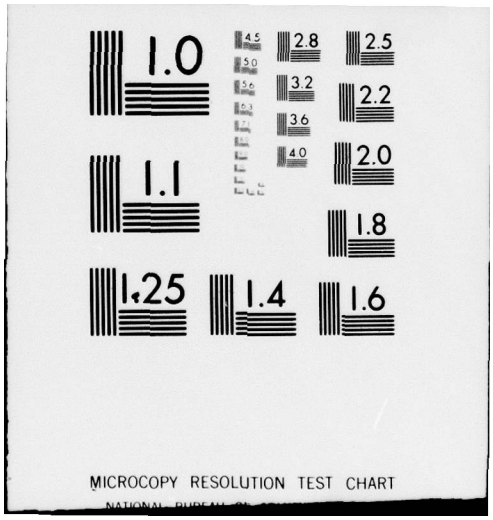
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7.1
8.0
9.0
MICROCOPY RESOLUTION TEST CHART

WOODS HOLE OCEANOGRAPHIC INSTITUTION

Woods Hole, Massachusetts

(14) WHOI-REF-49-55

(12) 33

Reference No. 49-55

(6) Average Monthly Layer Depth in the North Atlantic.

(10) by

F. C. Fuglister

(9) Technical Report,

Submitted to the Office of Naval Research

Under Contract No. (15) N6onr-277

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(11) Dec [redacted] 49

APPROVED FOR DISTRIBUTION C. O'D. Iselin

Director

RESTRICTED

Average Monthly Layer Depth
in the North Atlantic.

This report presents the first of a series of technical charts showing average monthly conditions in the North Atlantic Ocean which influence the performance of sonar equipment. The area covered is from the equator to Latitude 60°N and includes the Mediterranean Sea. Not included are the areas inshore of the 100 fathom depth contour and the Gulf of St. Lawrence.

Layer Depth as given on these charts represents the depth to the start of the seasonal thermocline or to the permanent thermocline in cases where the seasonal thermocline is absent. It does not represent the depth of isothermal water since diurnal warming and slight negative and positive gradients may be present within the layer. These less permanent gradients will be the subject of the second in this series of technical charts.

Throughout the major part of the North Atlantic, north of Latitude 20°N, the Layer Depth follows a clear cut seasonal cycle. It is shallowest during June and July becoming slightly deeper in August. From August until March the Layer steadily deepens. The available data indicate that over a large portion of the North Atlantic Layer Depth is greater than 450 feet during January, February and March. Because more than half of the bathythermograph observations available do not reach to a depth of 350 feet and only a small fraction go below 450 feet, the actual Layer Depth over much of the area during these months cannot be determined with any degree of accuracy. Hence, no isobaths for depths greater than 450 feet have been drawn.

During March, April and May there is a transitional period where warming starts at the surface. Over a broad band running across the ocean Layer Depth becomes very erratic. It may be at a maximum or a minimum or it may reach to intermediate depths above a small, one or two degree, thermocline. This transitional area moves northward during the three months and is easily recognizable on the charts.

Besides this transitional area there is one other principal region where Layer Depth is extremely variable. This is the Gulf Stream area, indicated by shading on Chart 1. Along the inshore edge of this current Layer Depth is shallow while in the main body of the stream it is at a maximum. Because of the fluctuating

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geographical position of the current, together with associate counter currents and eddies, the Layer Depth for any particular segment of the region is constantly changing.

The twelve Layer Depth charts accompanying this report are based on over 100,000 bathythermograph observations and several thousand Nansen Bottle stations. The values were averaged for each 30 minute quadrangle and for each month of the year. The first rough plots of the isobaths were based on 5 degree quadrangle averages. With these as a guide and bearing in mind the seasonal progression, the more detailed 30 minute quadrangle charts were studied and the final charts constructed.

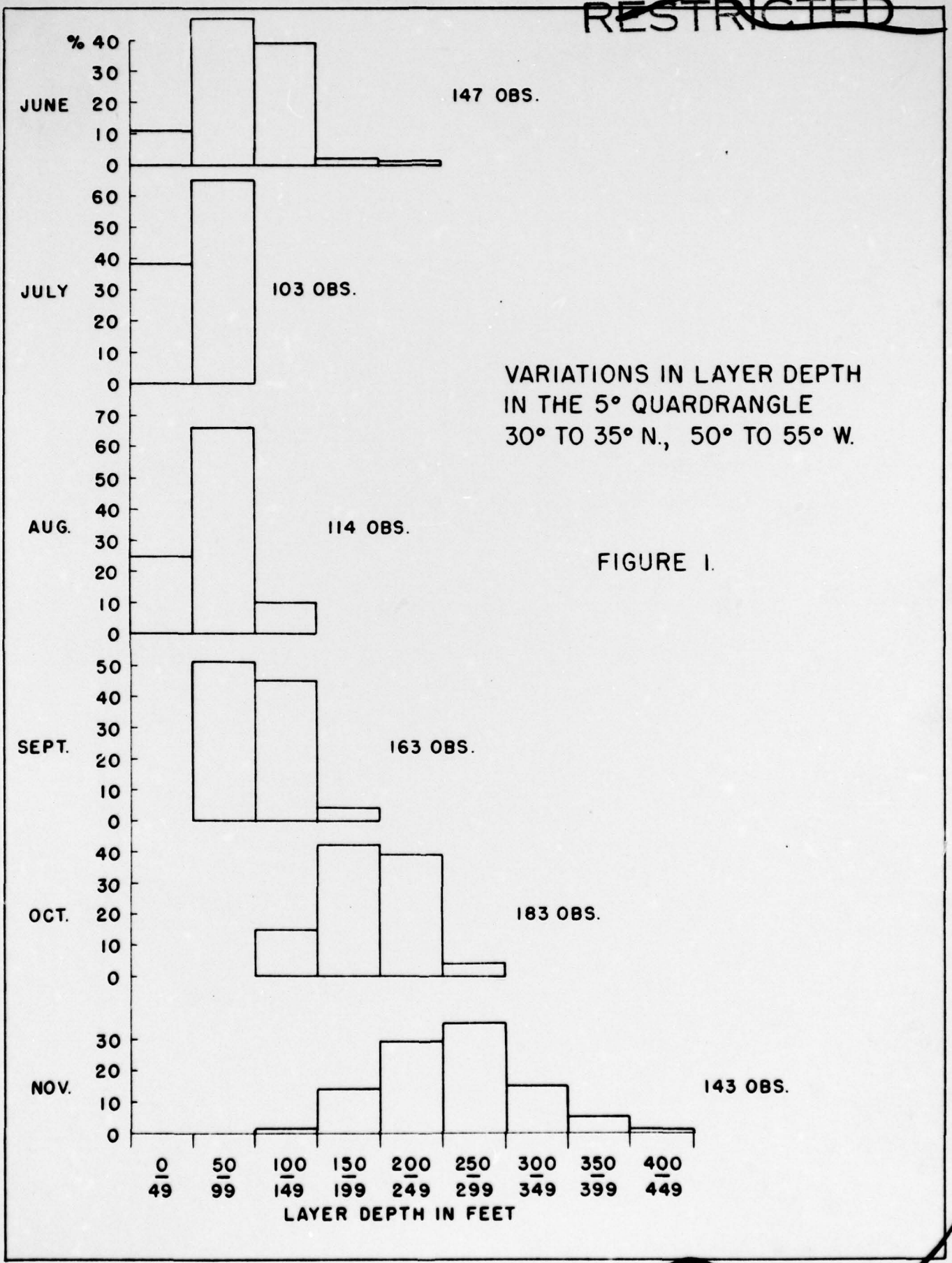
The distribution of observations over the North Atlantic is by no means uniform. Chart 1 shows the areas, off the northeast coast of the United States and off the Grand Banks, where there is the "best" distribution of data, that is, where there are observations available for each month and many of the winter observations are deep enough to determine Layer Depth. In the areas marked "good", in the central Atlantic, the Mediterranean and the Straits of Florida there are observations available for all months but they are not deep enough during the winter months. The regions marked "fair" do not contain data for every month of the year and the regions marked "poor" have only a scattering of bathythermograph and Nansen bottle stations.

No attempt has been made to show quantitatively the deviations from the average monthly Layer Depth. This would be difficult to do for the winter and spring months because of the large percentage of observations that do not reach to the depth of the thermocline. In those regions marked "fair" and "poor" on Chart 1 there are insufficient data to give deviation curves for any month of the year.

Excluding those areas of strong currents, where Layer Depth depends on the varying position of the currents, it can be stated qualitatively that the deviation from the average Layer Depth varies with the depth. When the average Layer Depth is shallowest there is the least variability. As the layer deepens the deviation increases, reaching its maximum value in the Spring.

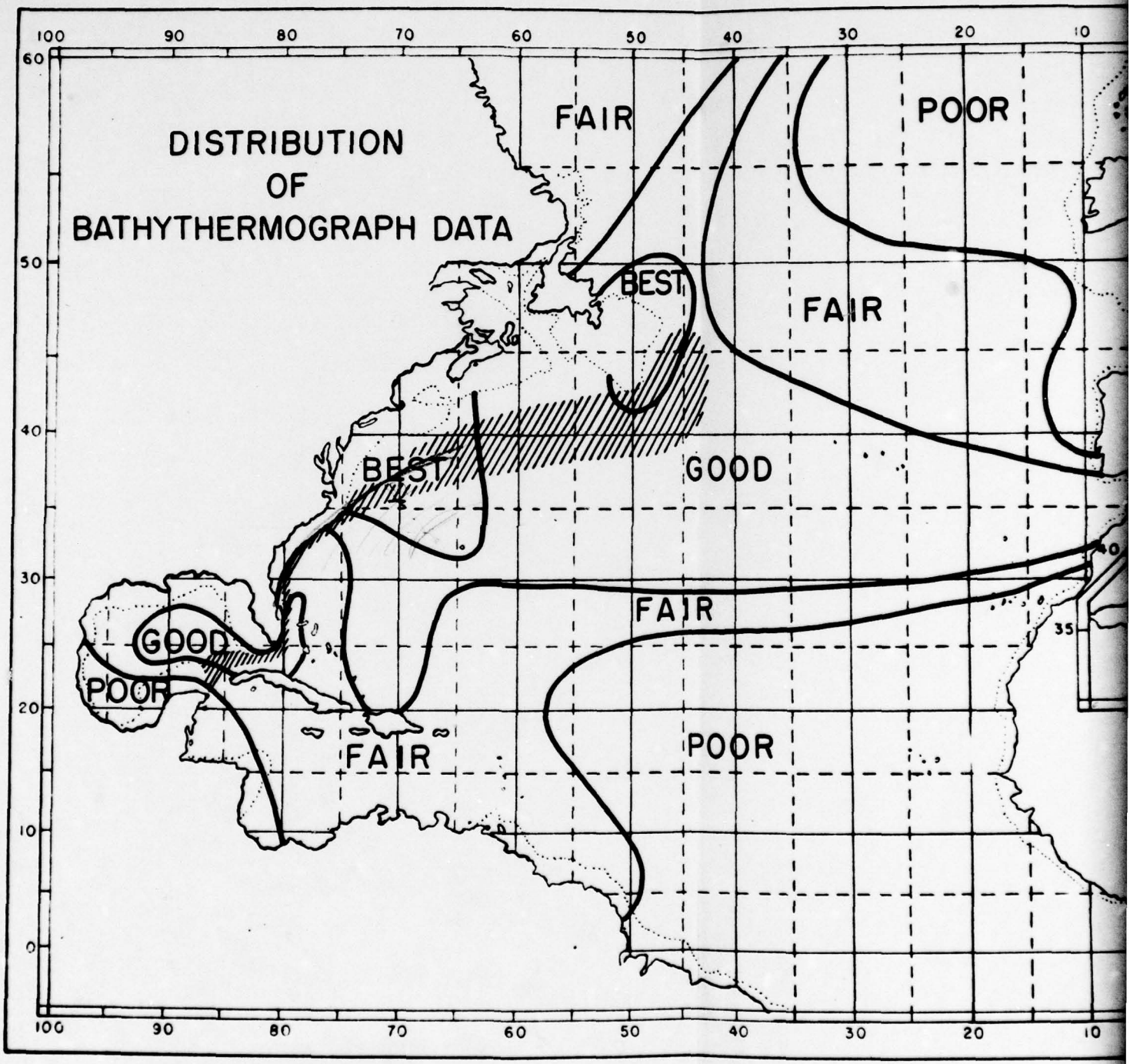
Figure 1 shows the monthly variations in Layer Depth for a 5 degree quadrangle in the mid-Atlantic. It shows that in June there are still some remnants of the Spring variability. July has the least variations and October and November show the increasing deviation as the Layer deepens.

The dashed lines on the Layer Depth Charts indicate where more observations are needed in order to determine definitely the positions of the isobaths. It is planned that these charts will be revised periodically as new observations become available.



VARIATIONS IN LAYER DEPTH
IN THE 5° QUARDRANGLE
30° TO 35° N., 50° TO 55° W.

FIGURE 1.


DISTRIBUTION
OF
BATHYTHERMOGRAPH DATA
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POOR
BEST
FAIR
BEST
GOOD
FAIR
GOOD
POOR
FAIR
POOR
100
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60
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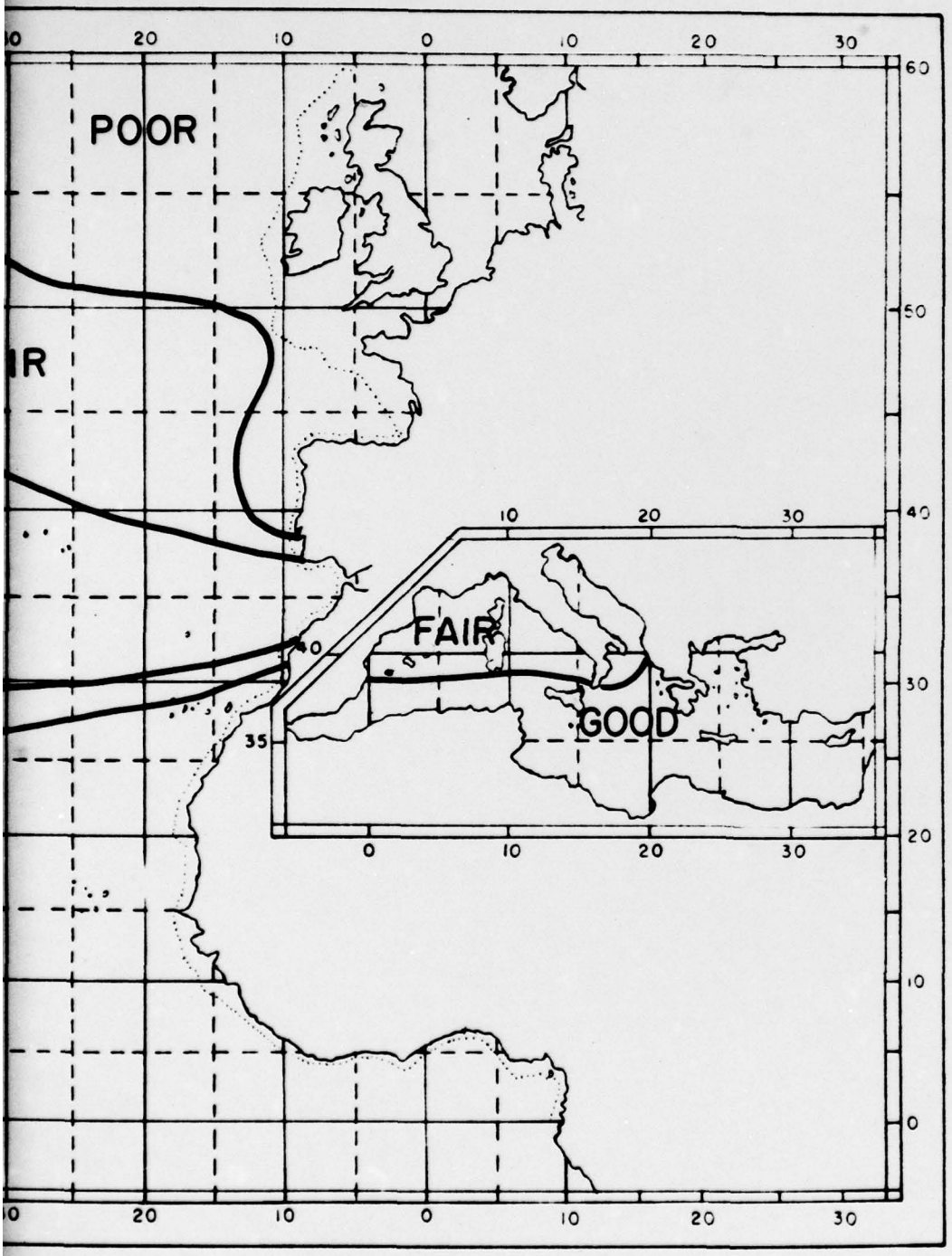
40
30
20
10
0
35

CHART #1



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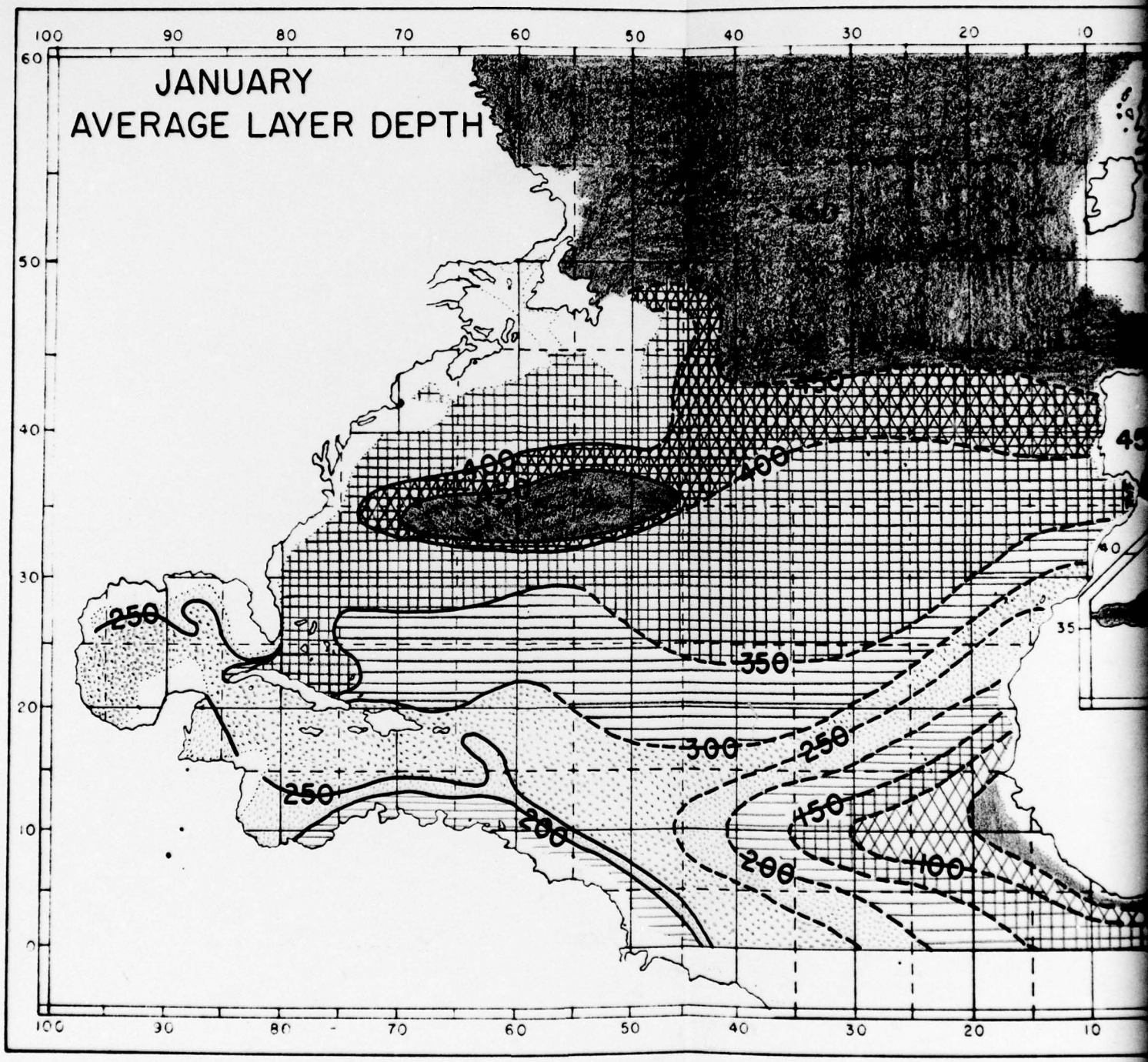
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40
30
20
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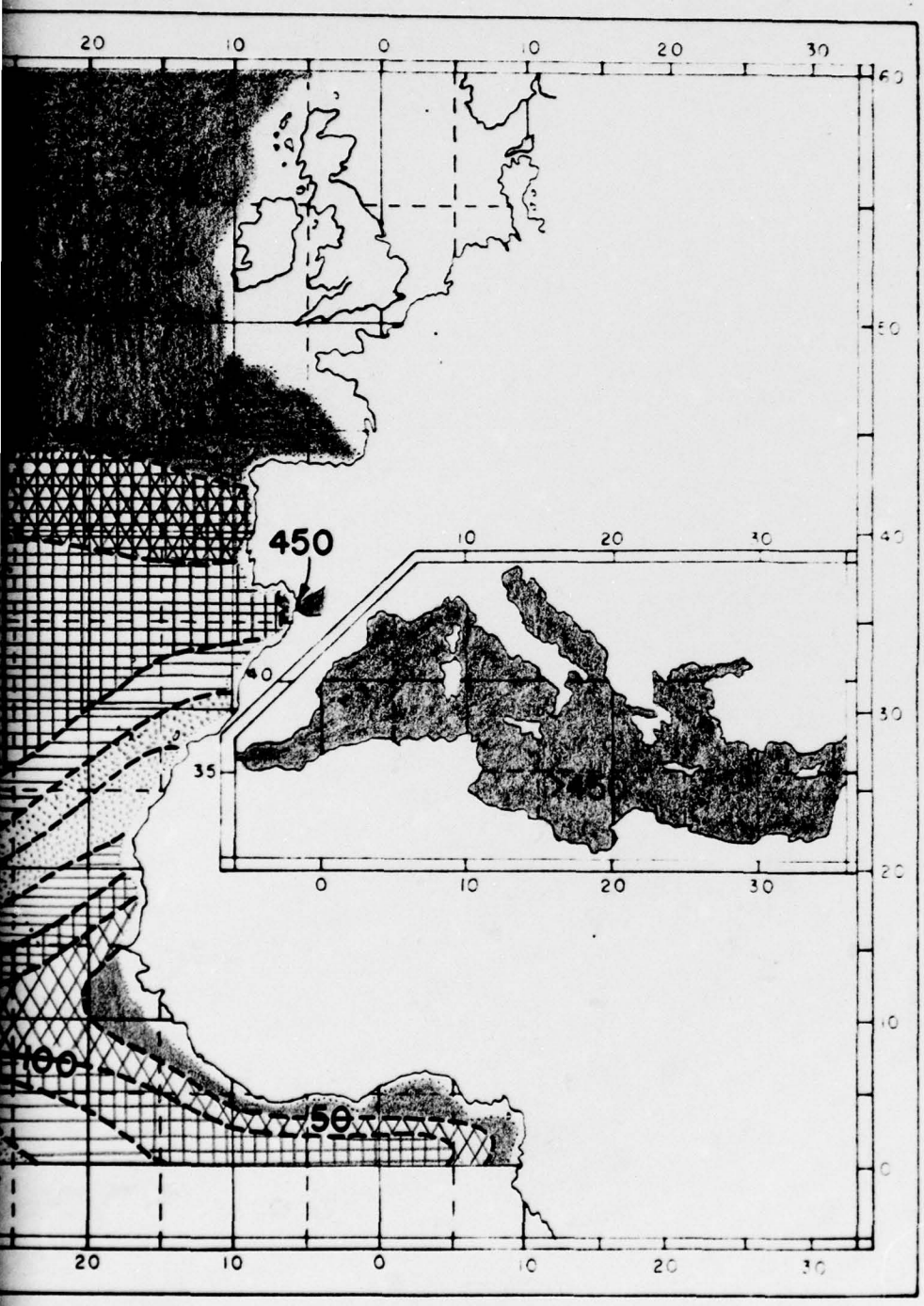
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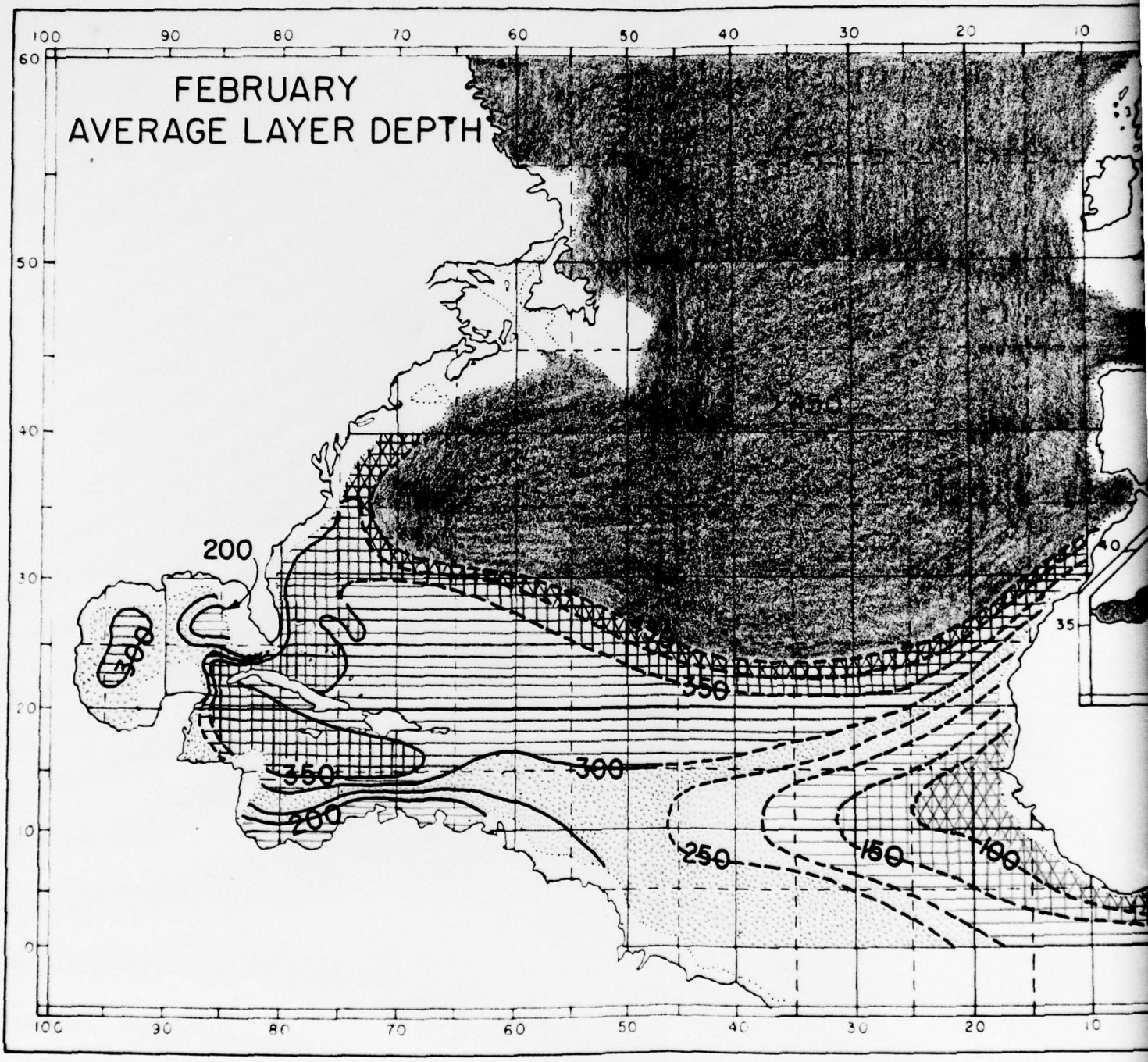
FEBRUARY
AVERAGE LAYER DEPTH
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80
70
60
50
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250
150
100
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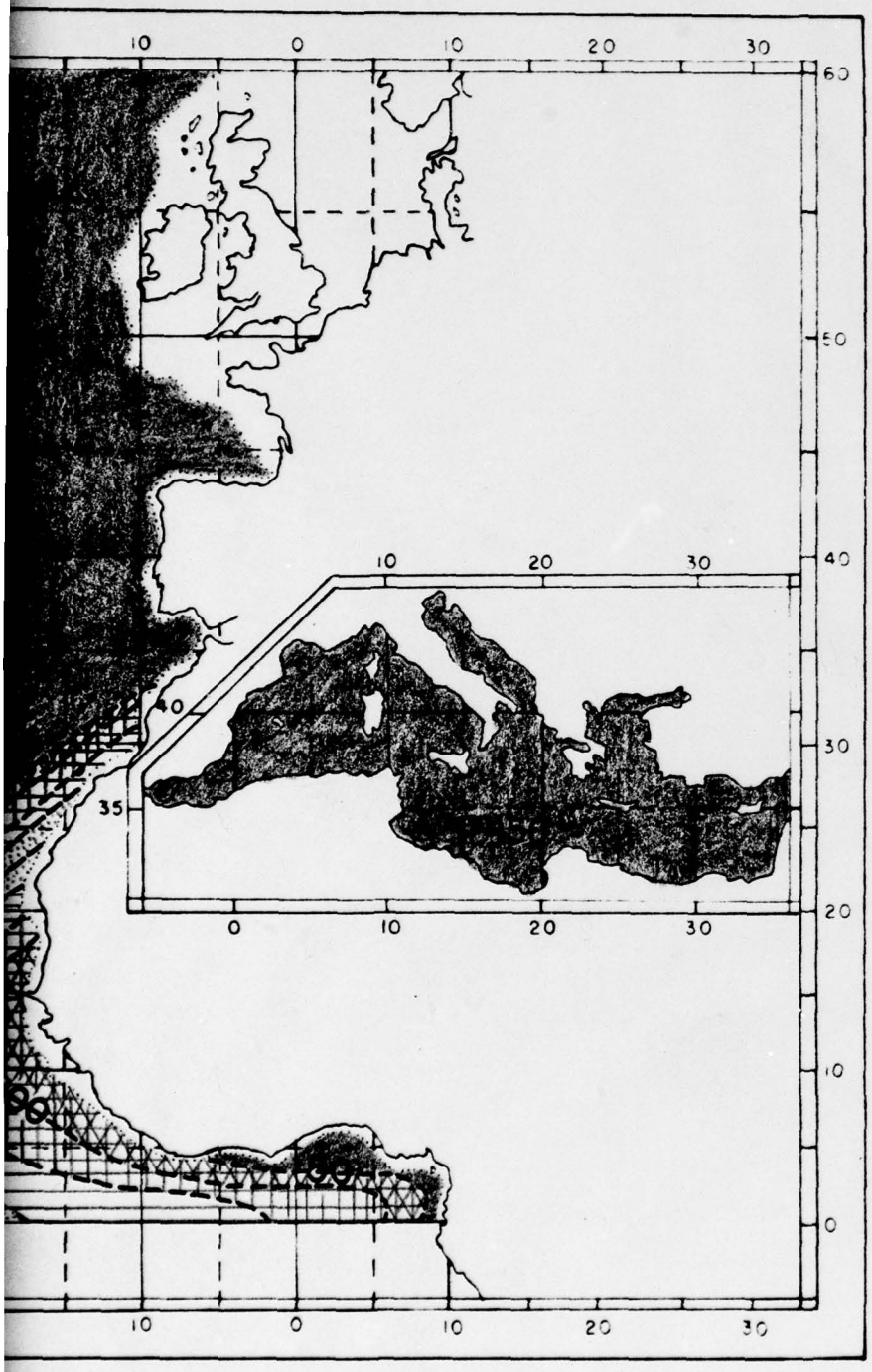
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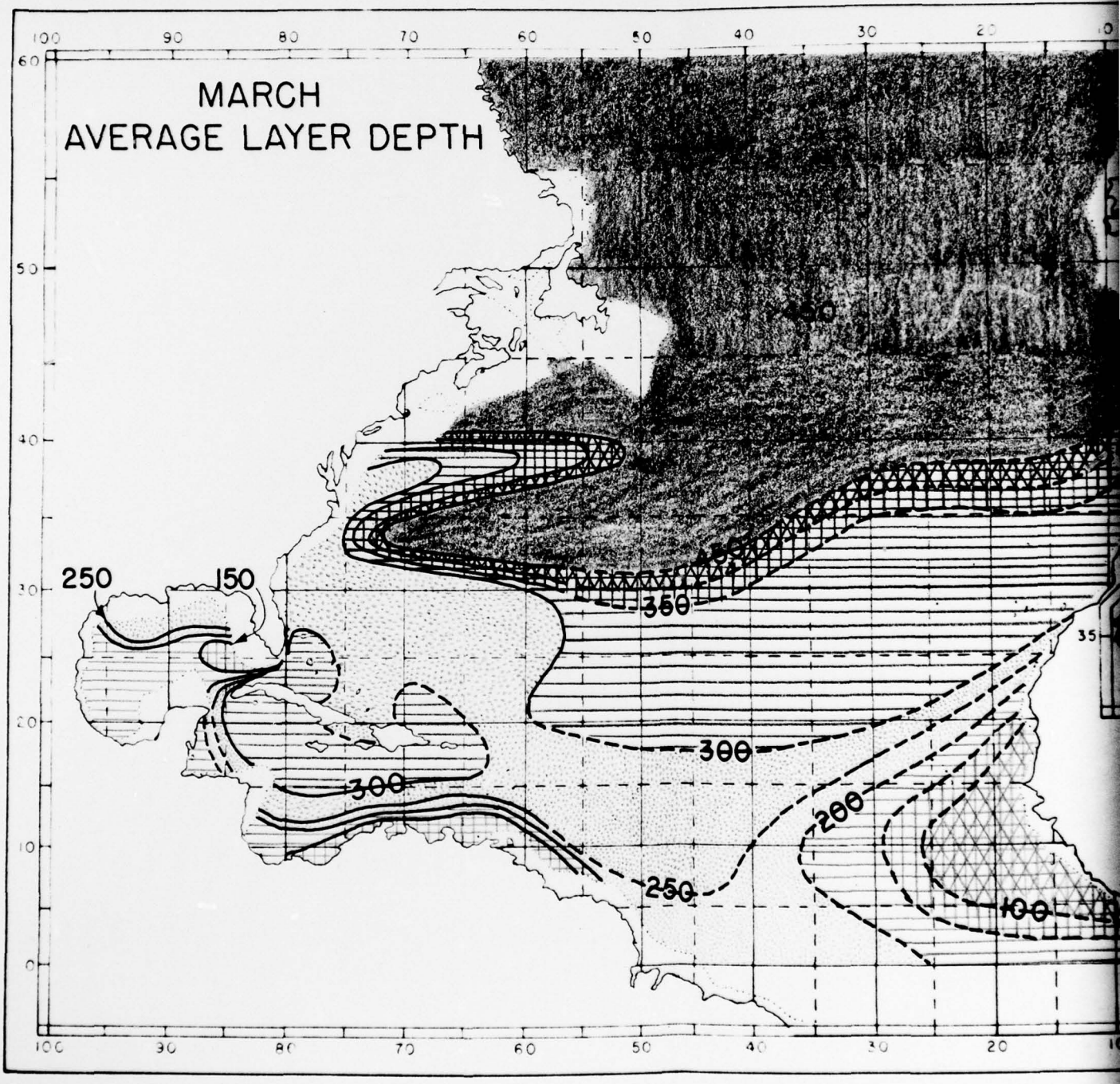
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AVERAGE LAYER DEPTH
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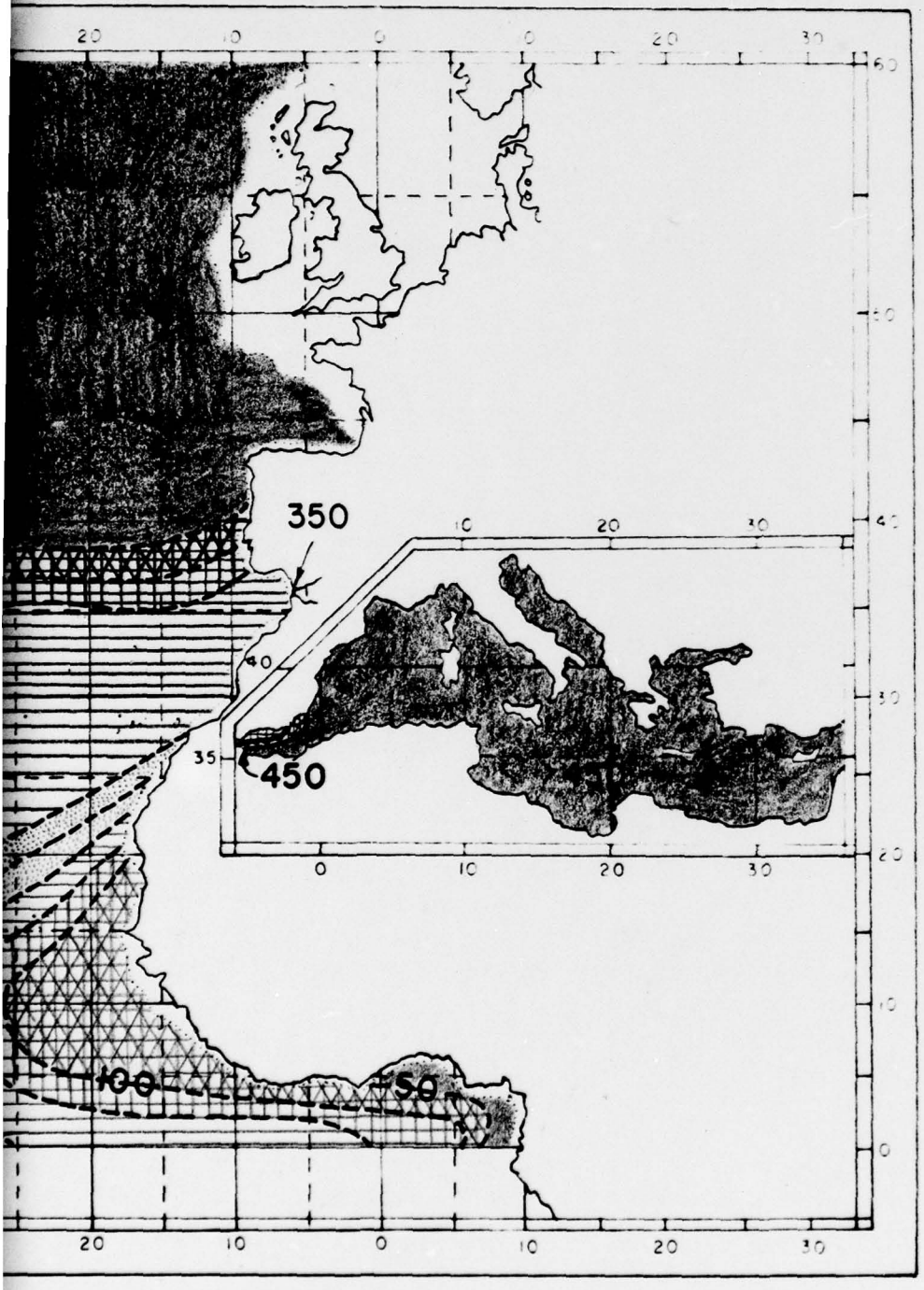
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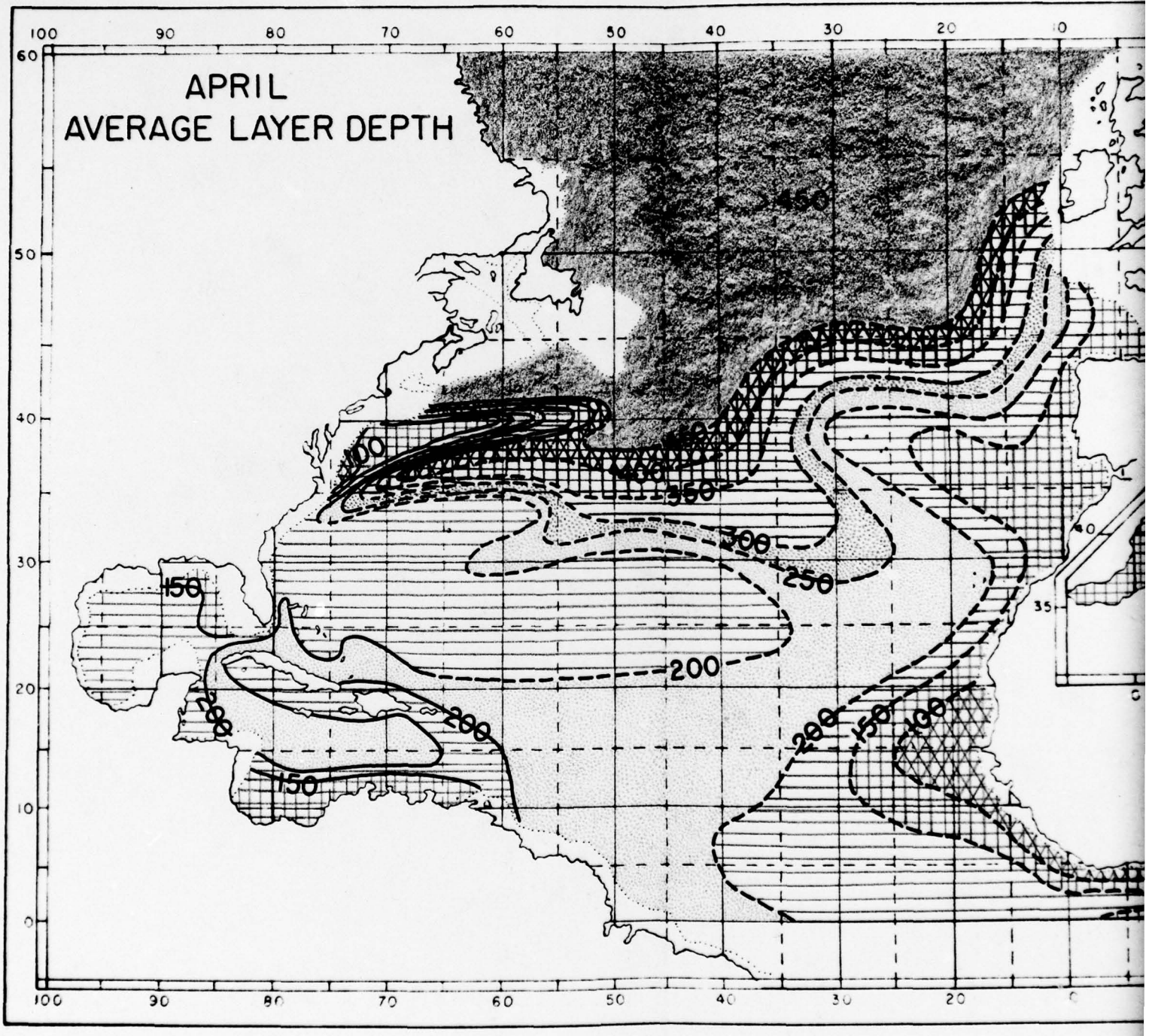
APRIL
AVERAGE LAYER DEPTH
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100
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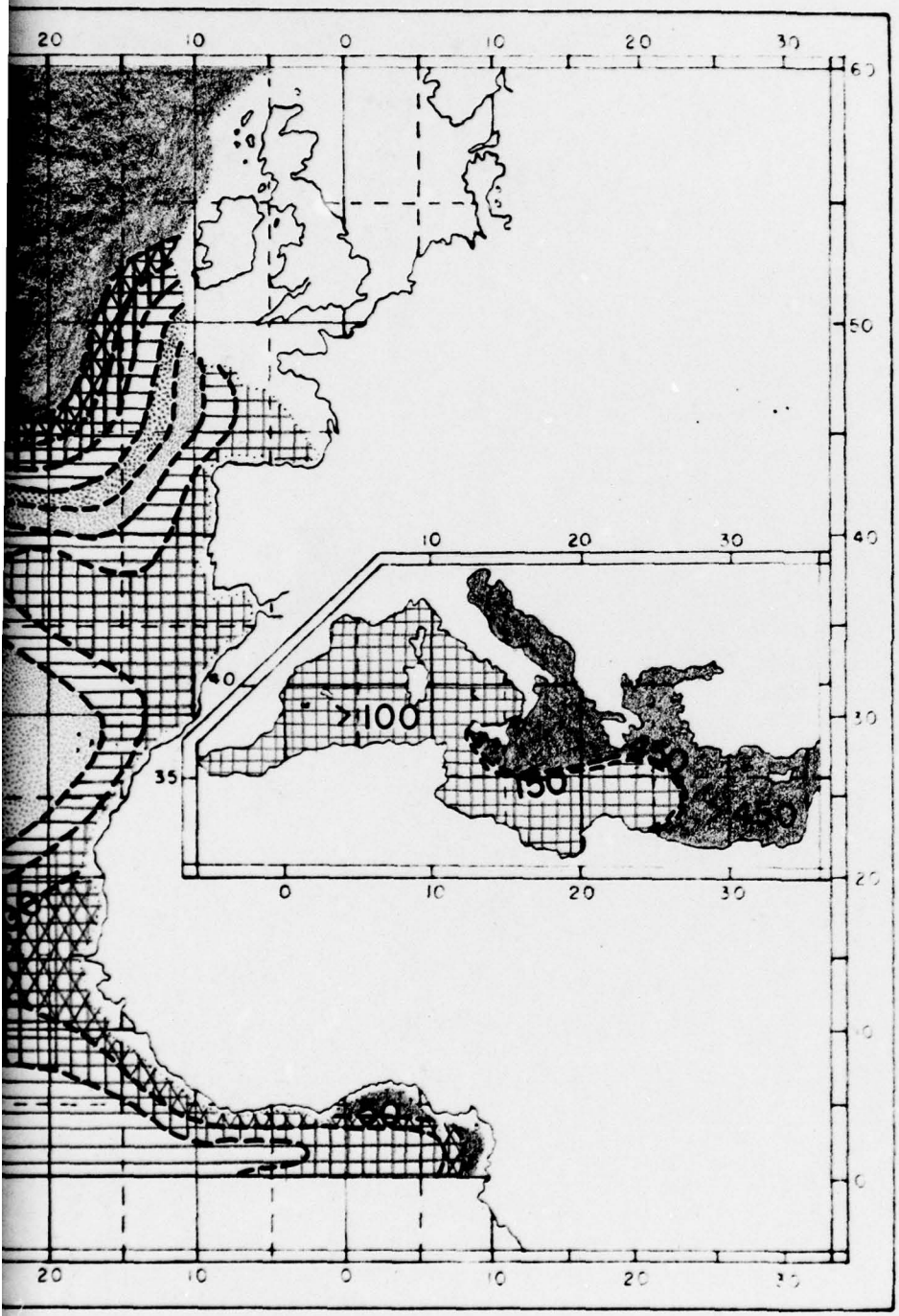
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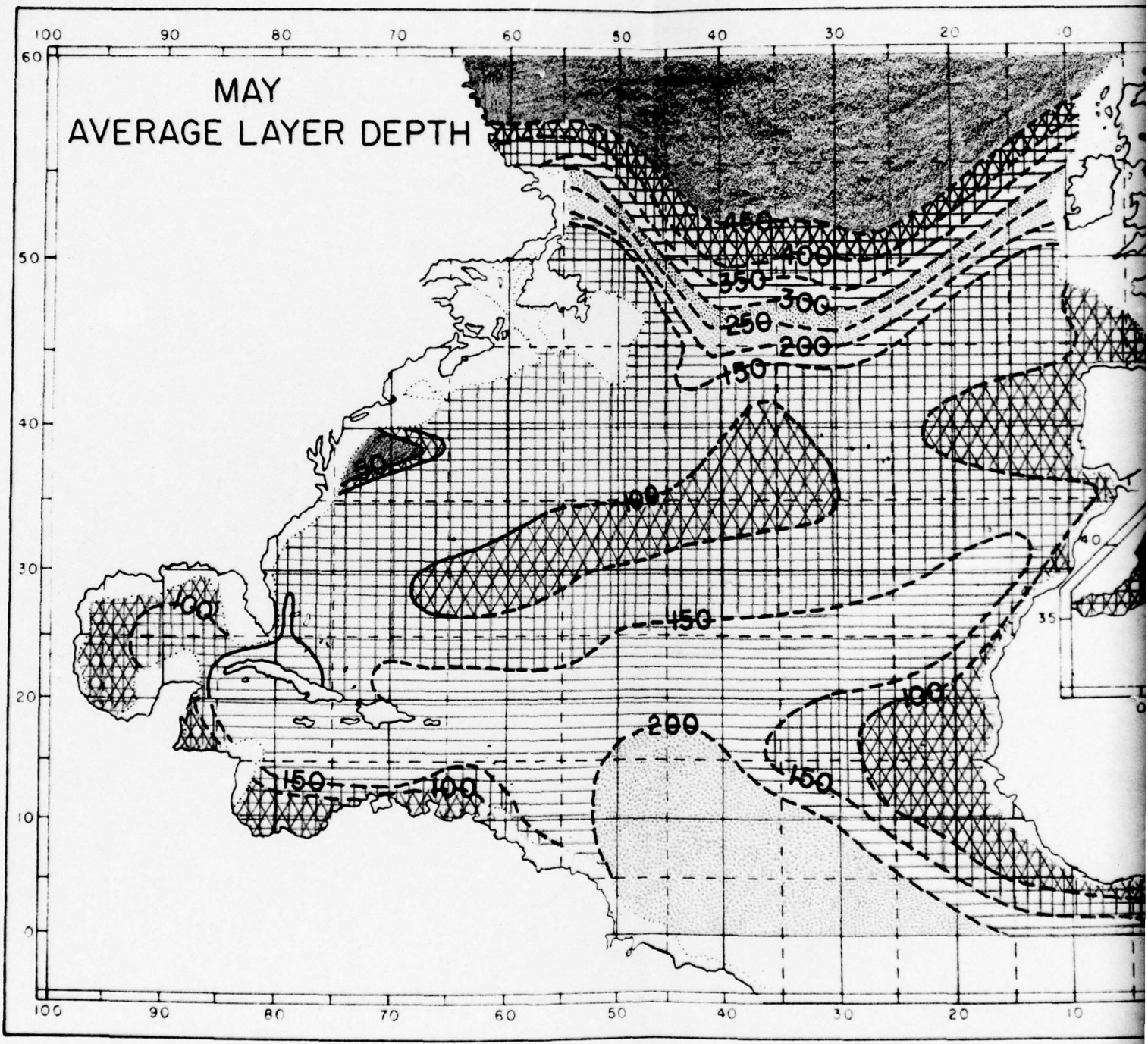
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AVERAGE LAYER DEPTH
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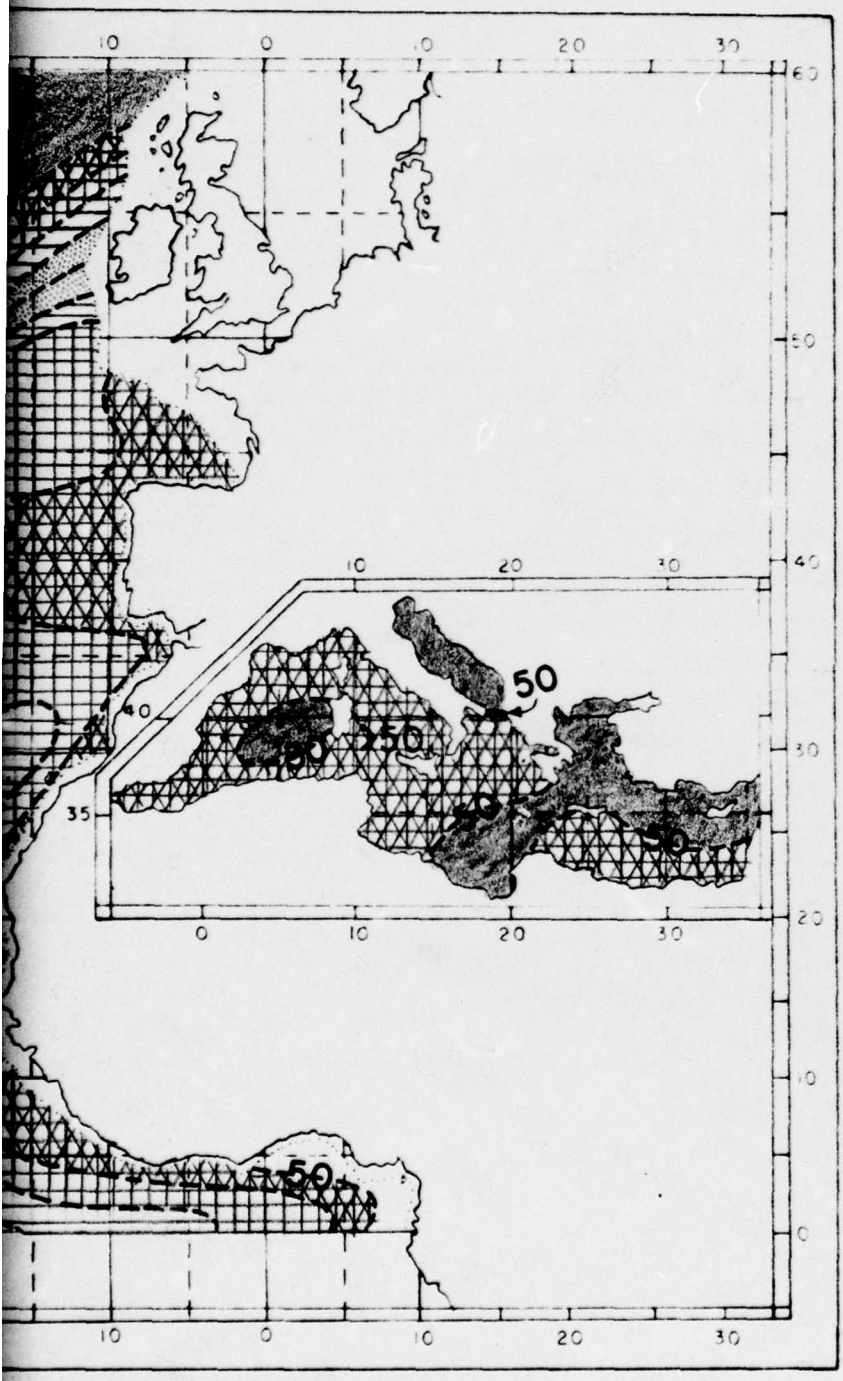
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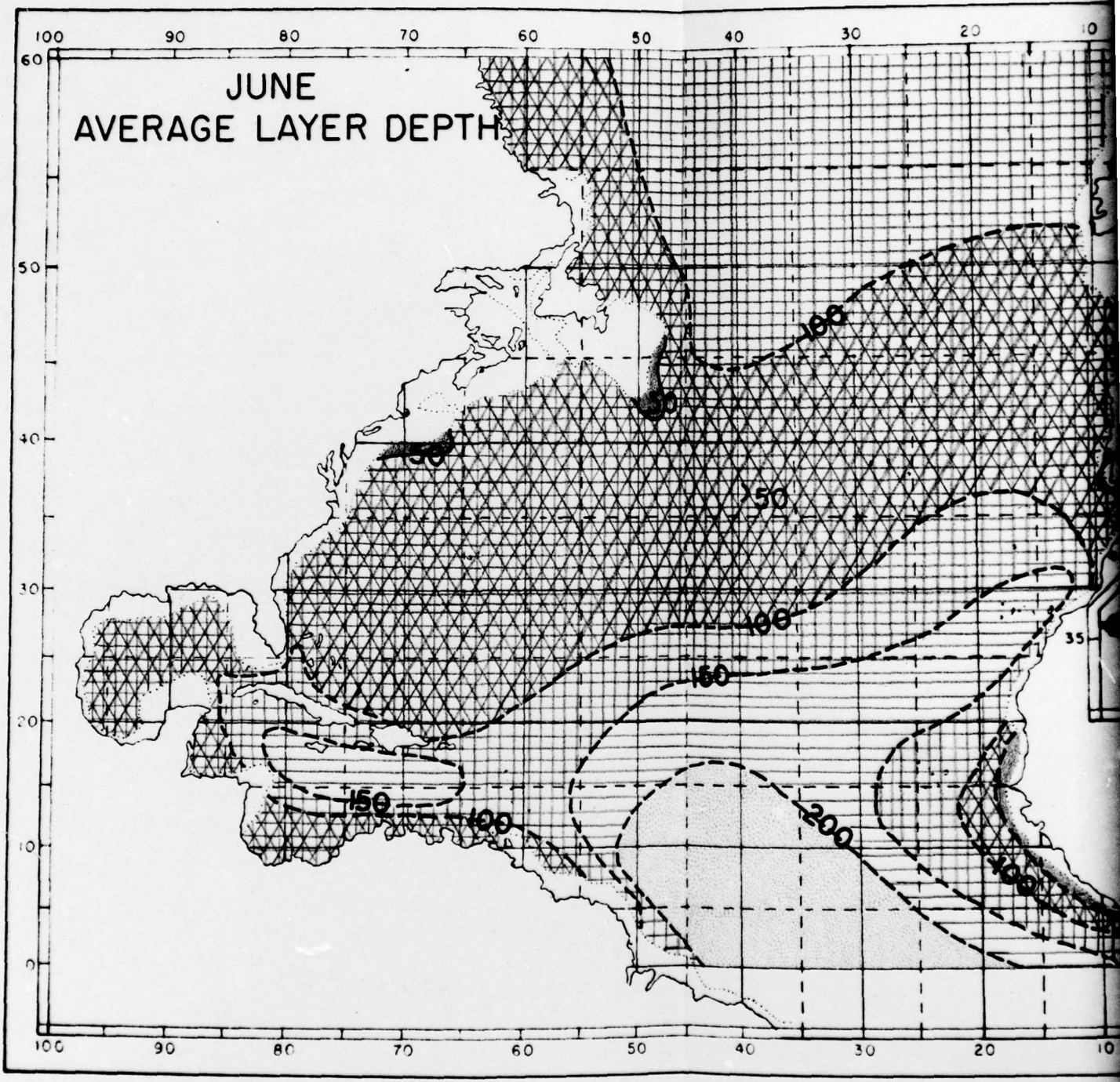
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AVERAGE LAYER DEPTH
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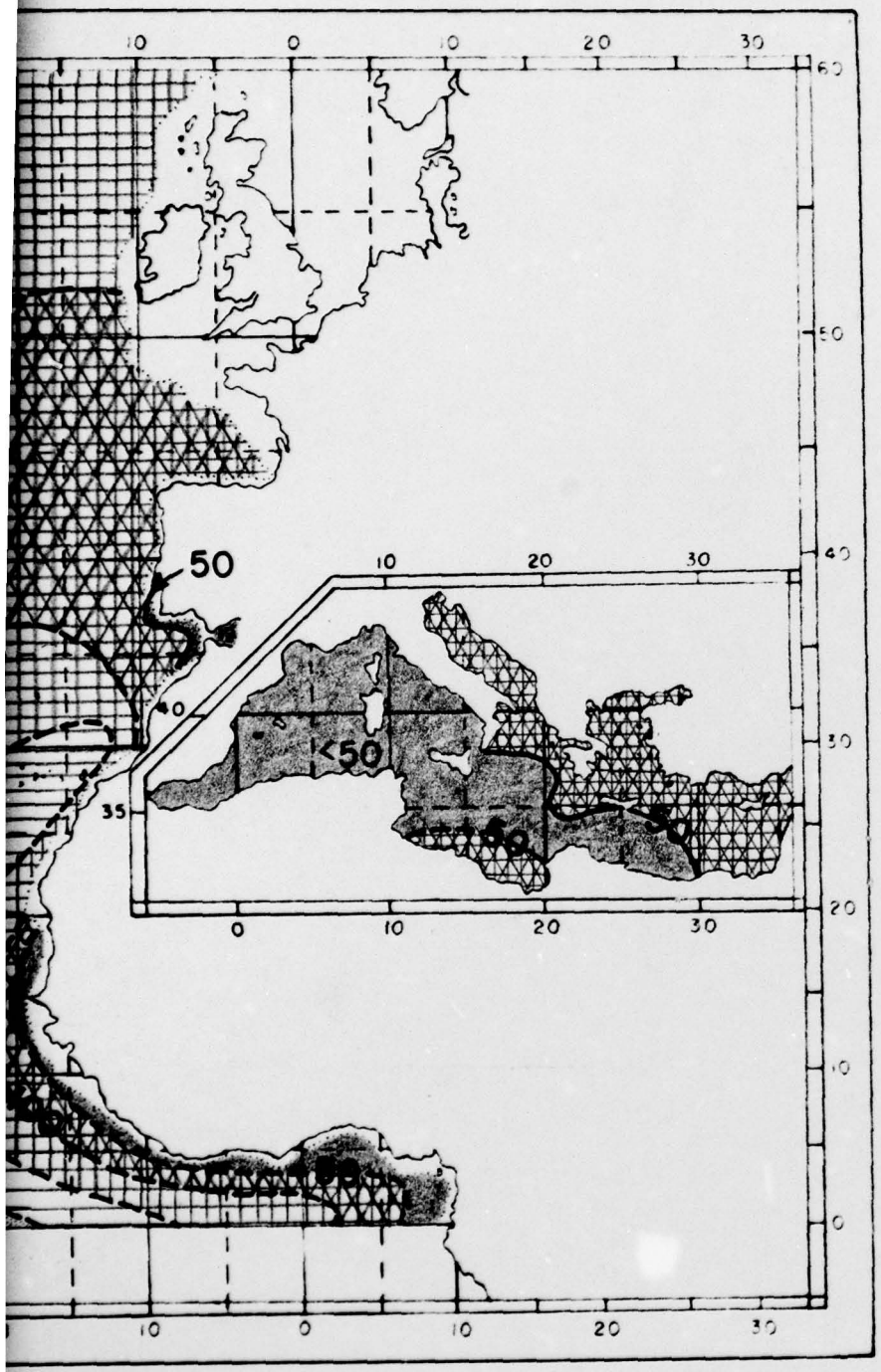

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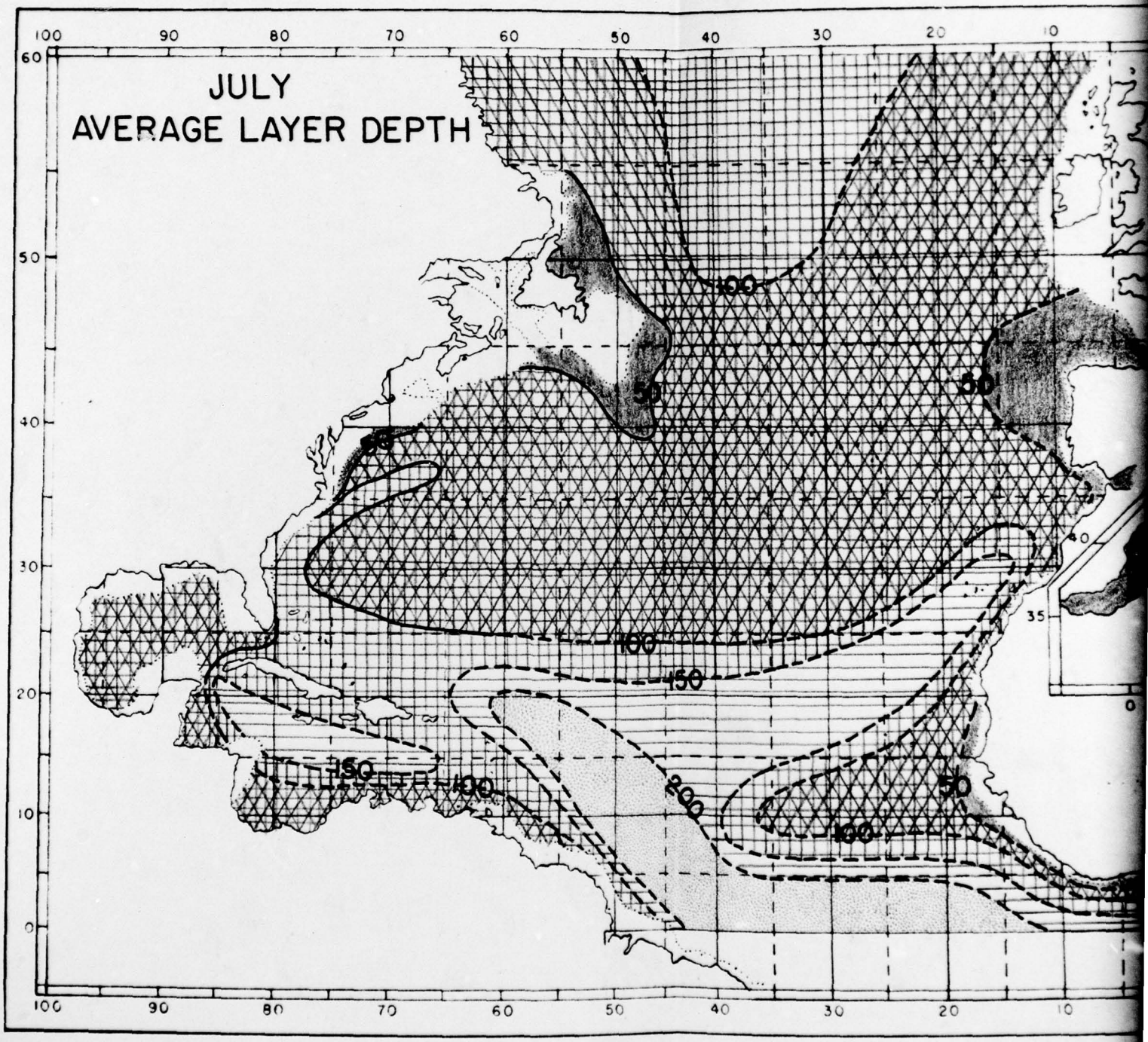
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AVERAGE LAYER DEPTH
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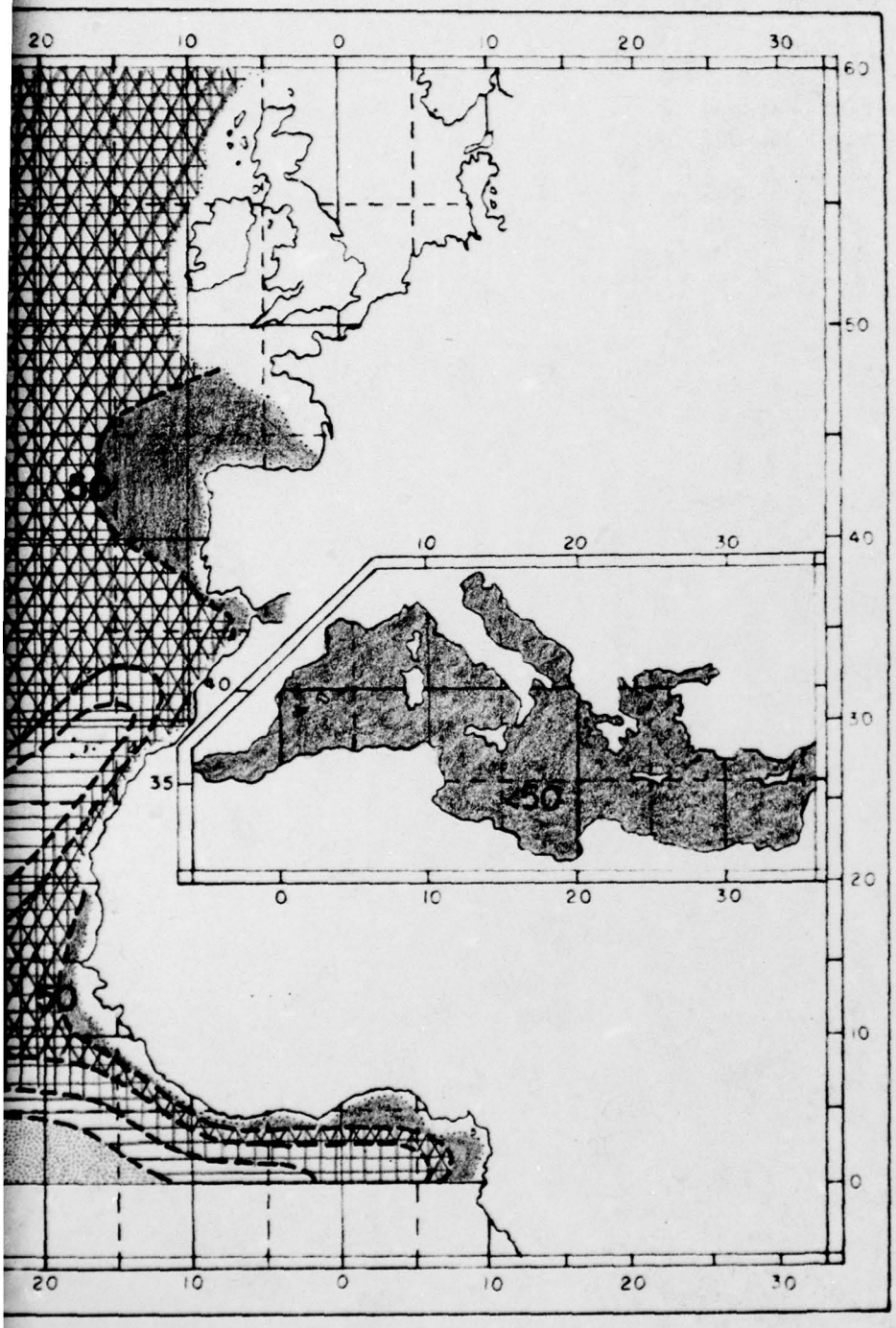
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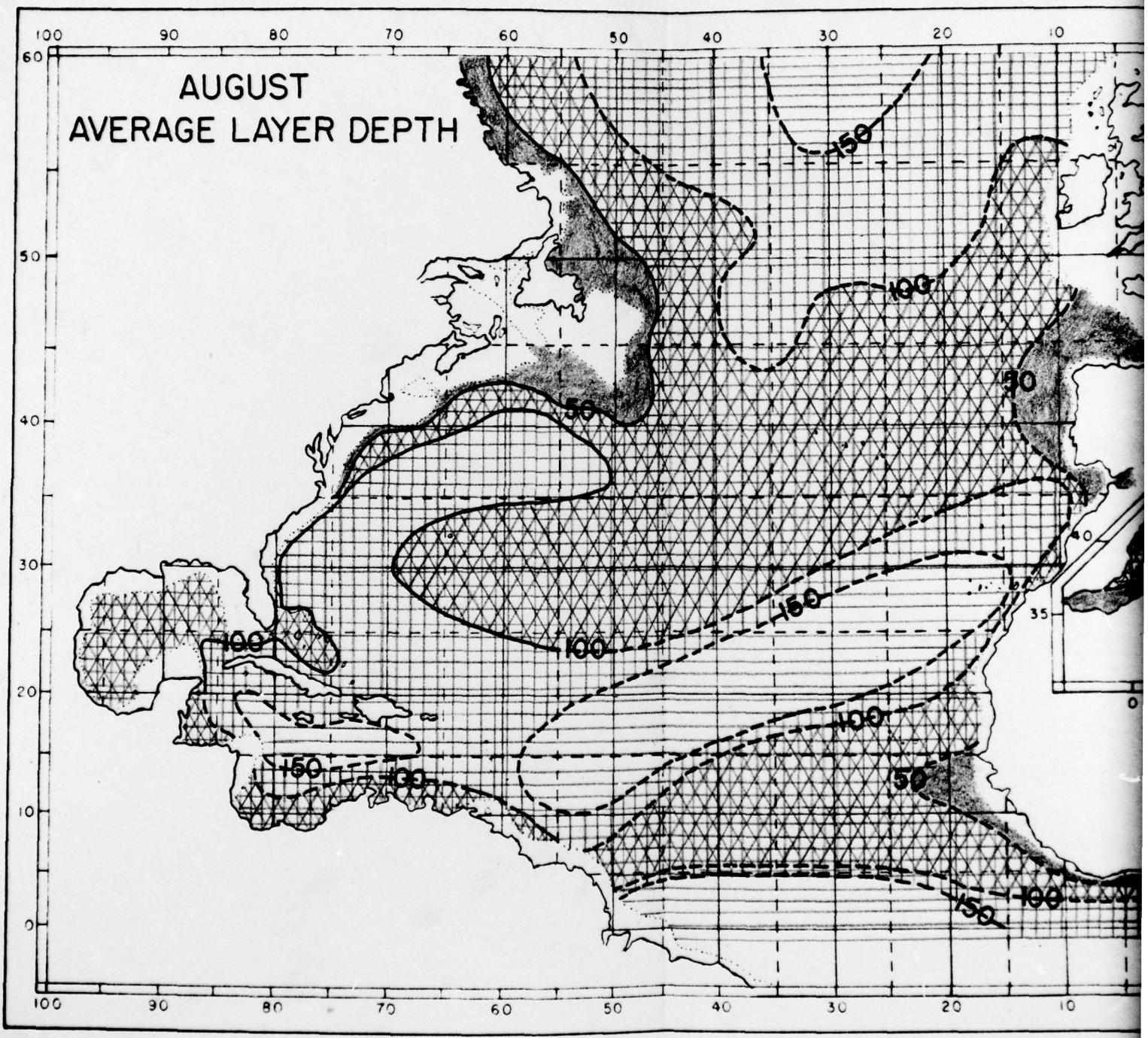
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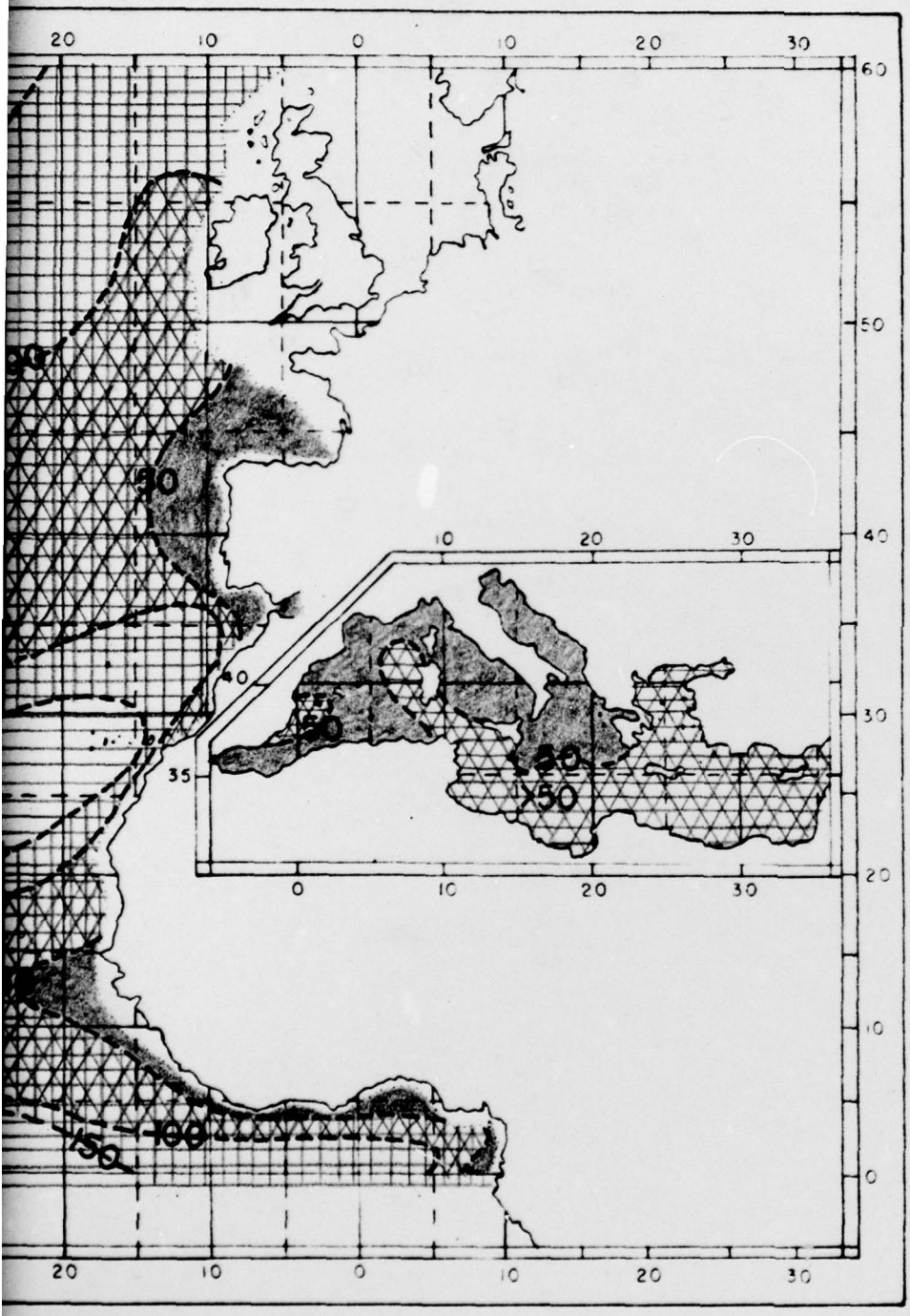
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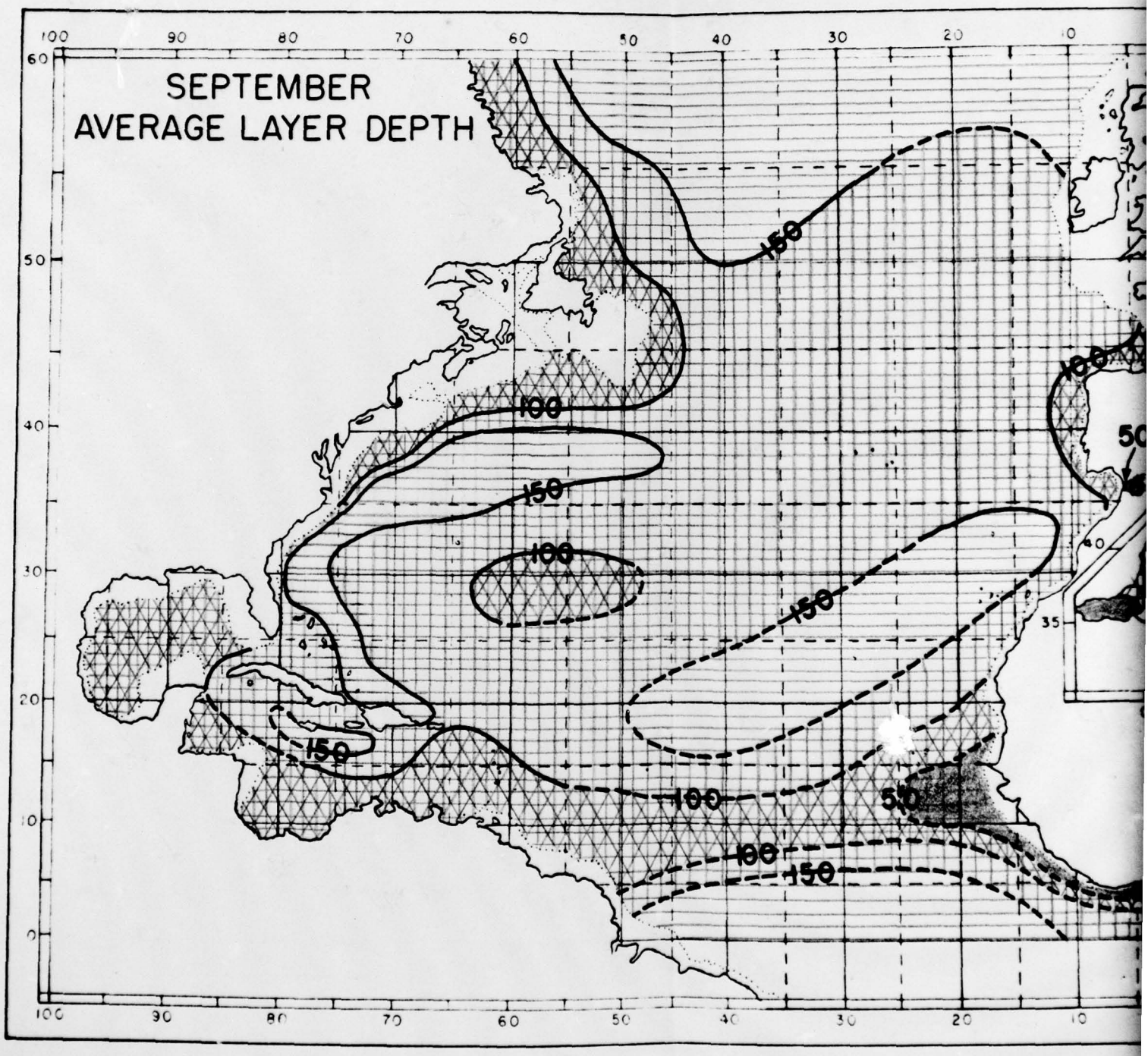
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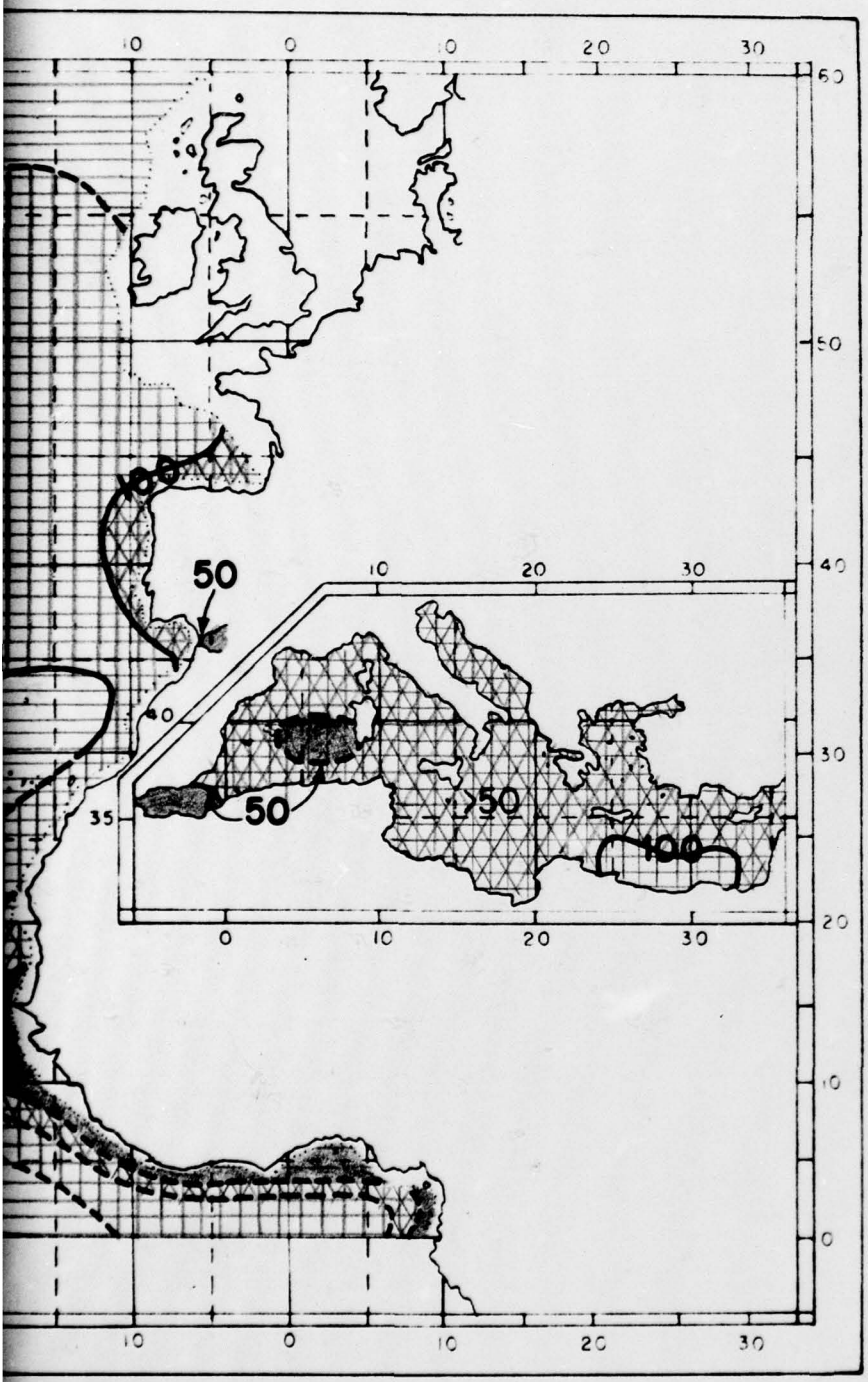
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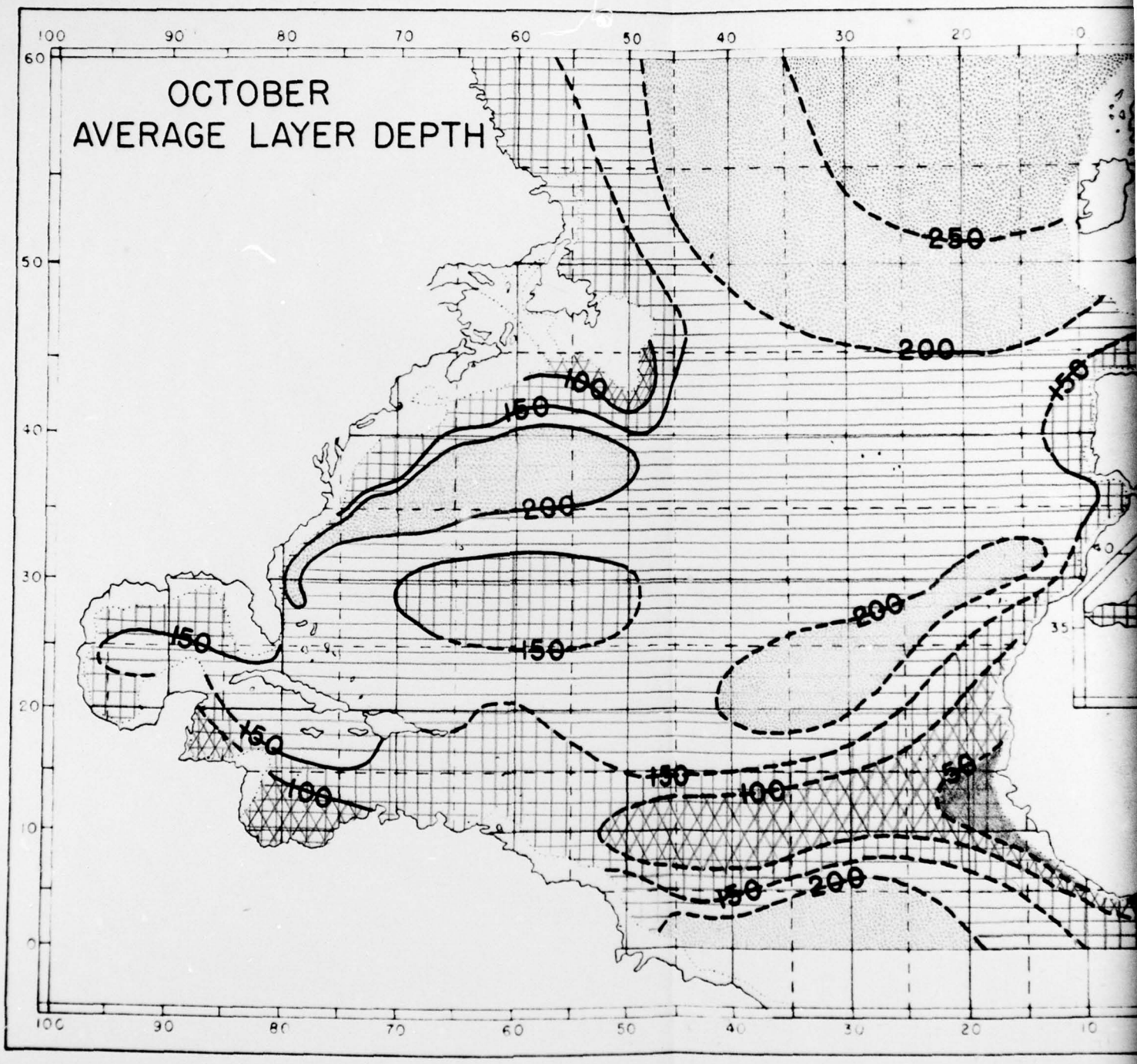
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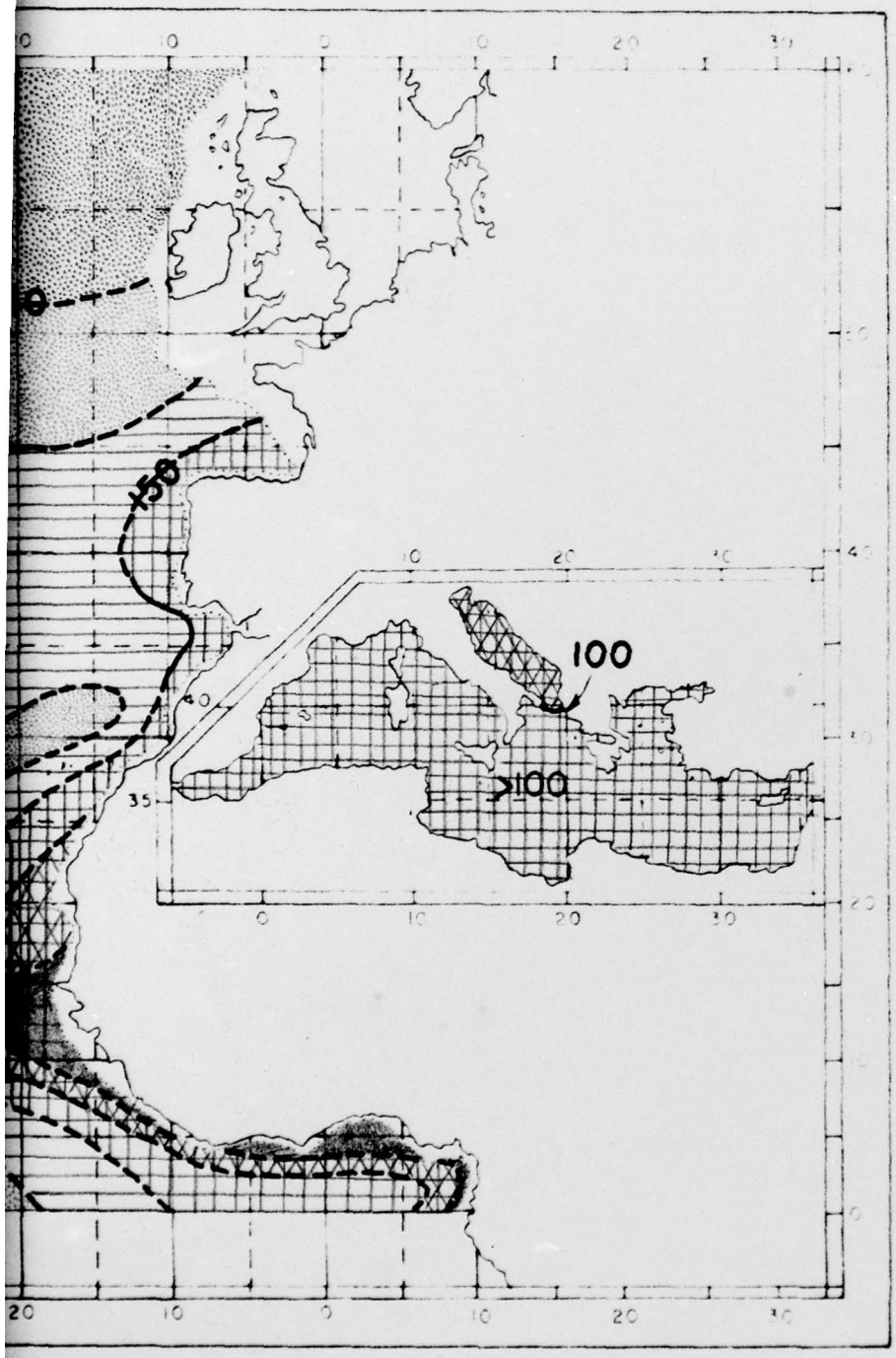
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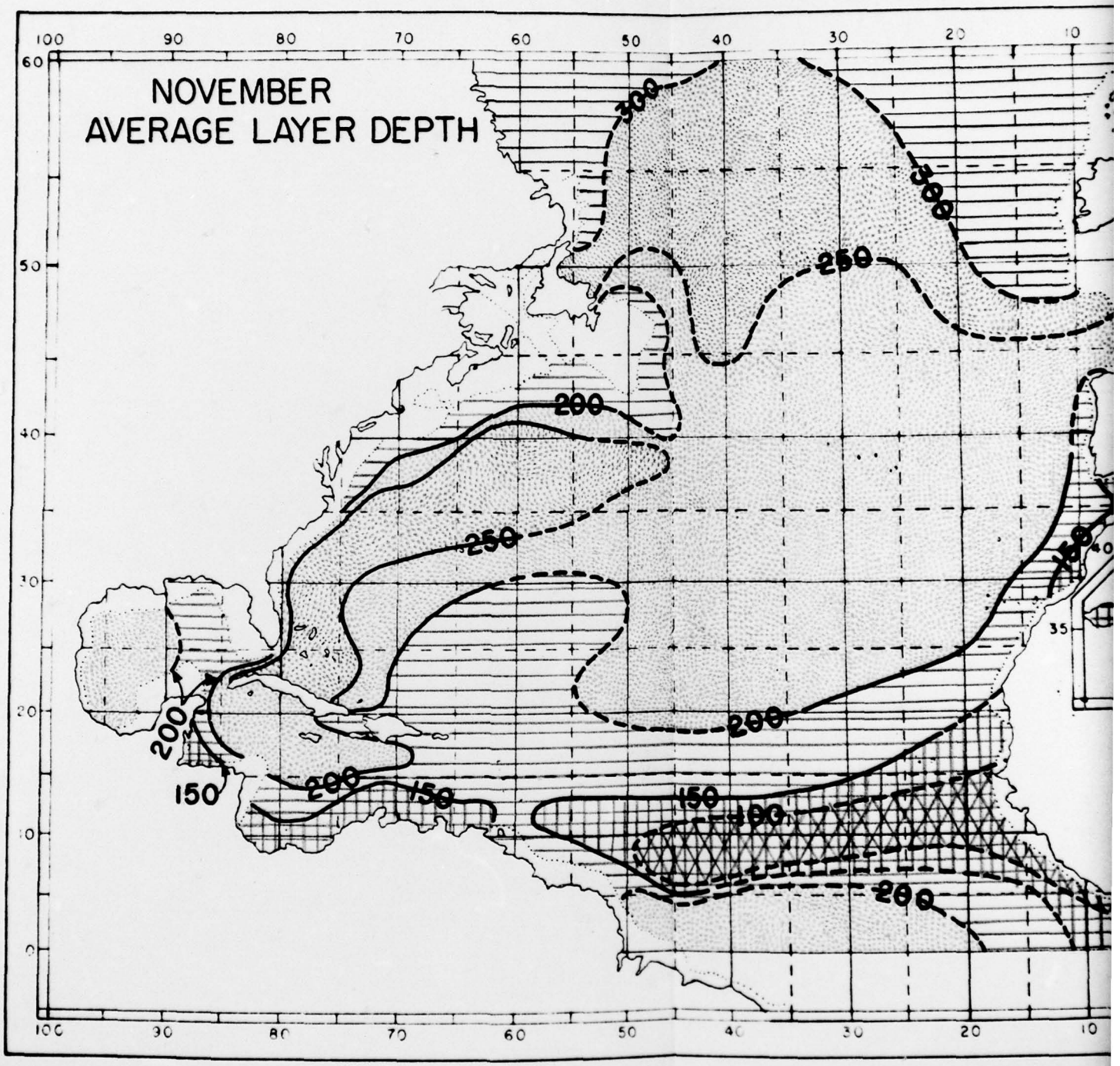
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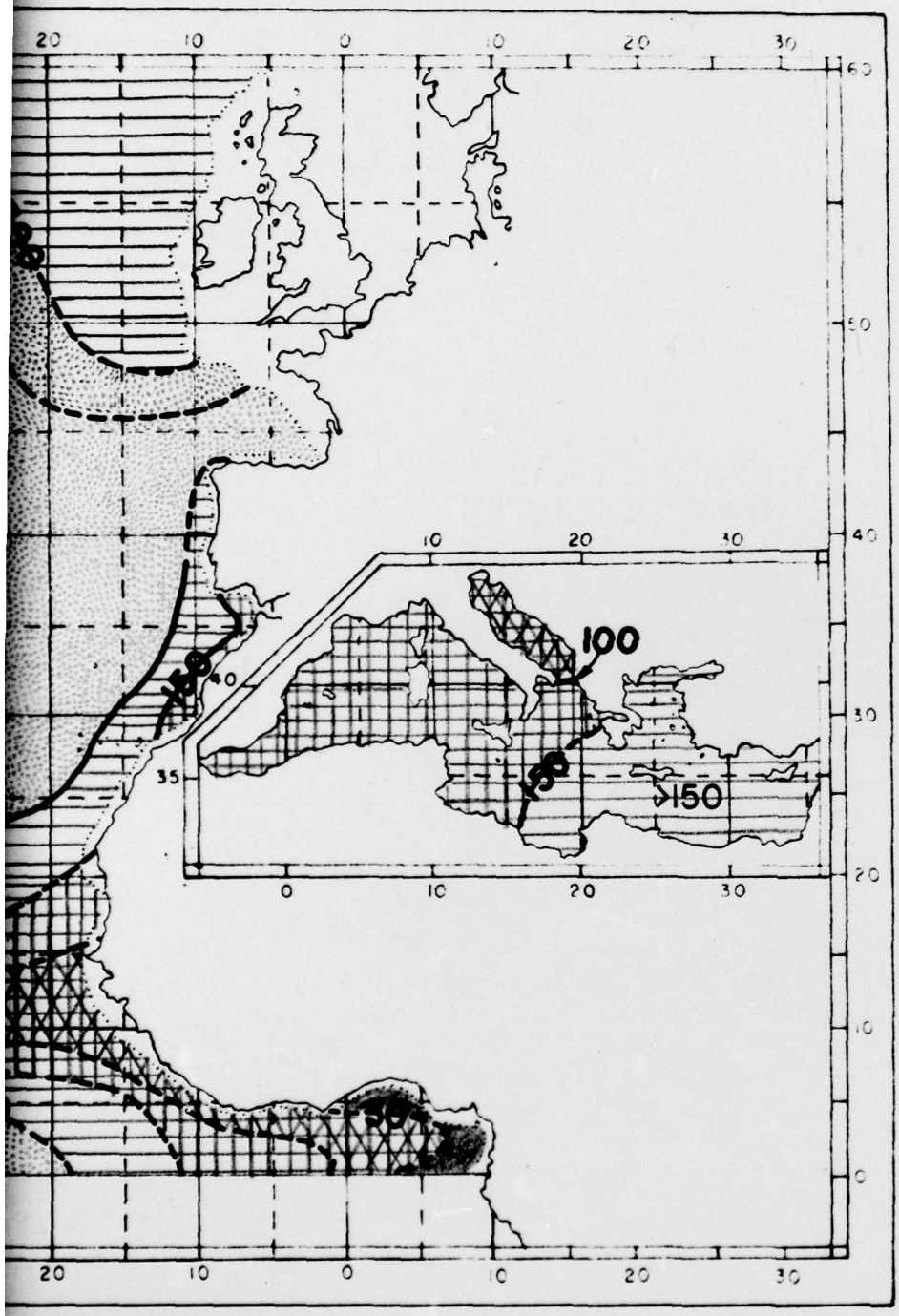
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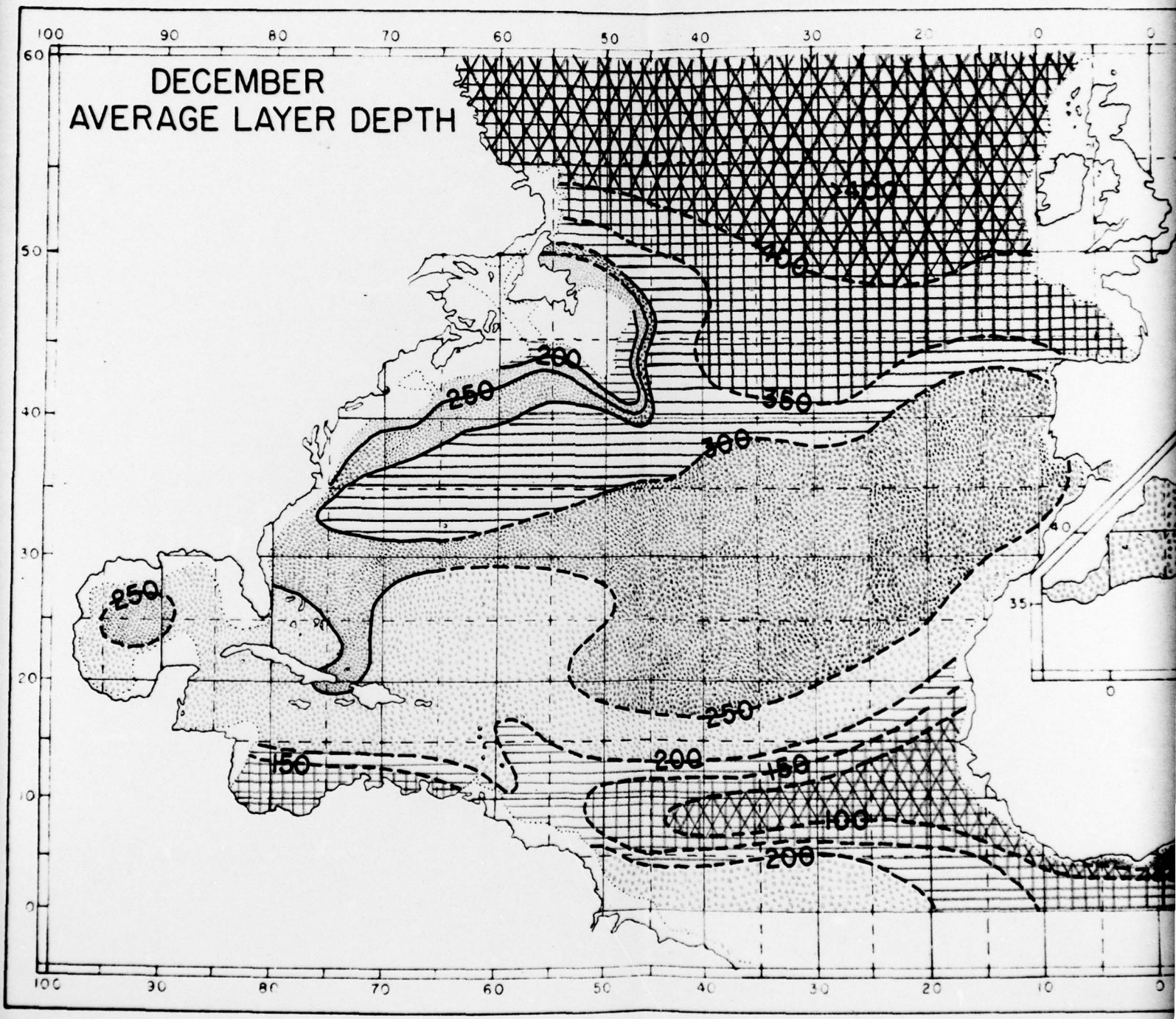
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AVERAGE LAYER DEPTH
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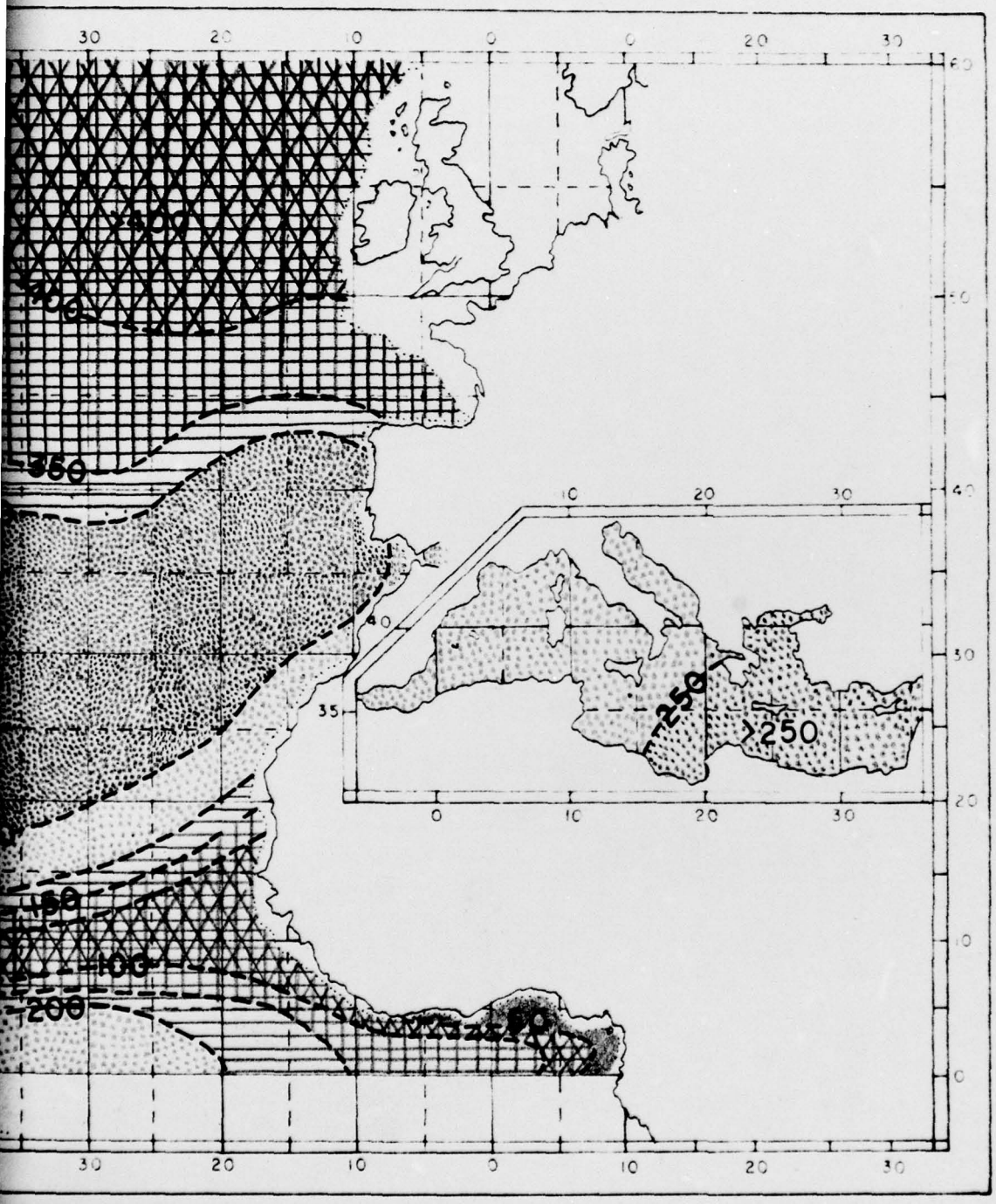
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